Novel "Nano-Phage" Interfaces for Wireless Biosensors

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The prevention of food-borne illness has become a very important factor in public health. Meantime, the conventional microbiological detection techniques are time consuming, require proficiency and appropriate laboratory conditions. Recently, there has been an extensive work undertaken towards the development of diagnostic biosensor devices for on-site detection of biological threats that explore a diversity of transduction mechanisms and bio-recognition elements. In particular, the environmentally robust filamentous phages have been successfully used as an alternative to fragile antibodies in wireless biosensor system for real-time pathogen detection. However, when phages are used as interface, they can aggregate forming bundles of fibers that cannot cover completely the sensor's interface leading to the decrease in sensor's performance. In this work we developed novel wireless magnetoelastic biosensors with interface formed by biorecognition nanoparticles called "nano-phage". "Nano-phage" comprises nanoparticles with diameter ~11 nm composed of self-assembled fusion major coat protein of landscape phages selected against the target analyte. For proof-of-concept, we investigated interfaces formed by three model phages selected from landscape libraries: streptavidin binders 7b1 and SAE10 and clone E2 highly specific and selective for *S. typhimurium*. Beside food borne pathogens, this new approach can be used to develop biosensors with increased performance for early detection of cancer diseases and other pathologies.

Keywords: Detection**,** biosensors, "Nano-phage", interface, landscape phage, *Salmonella typhimurium*, streptavidin.